

**We claim**

1. Static mixer/heat exchanger comprising a housing (6) for a product to pass  
5 through, a product inlet and outlet, at least two tubes (1), each of which is  
provided with a passage (3) for a heat-transfer medium to pass through, the  
housing surrounding the tubes (1), a multiplicity of heat exchanger fins (2a,  
2b) distributed over the circumference of the tubes (1), and arranged in at  
least two parallel layers (7, 8) along the tubes (1), and wherein the fins (2a)  
10 and (2b) belonging to adjacent layers (7, 8) are rotated through an angle  $\alpha$  of  
 $45^\circ$  to  $135^\circ$  with respect to one another about the axis of the tubes (1), and  
wherein the fins (2a, 2b) are disposed at an angle  $\beta$  of  $\pm 10^\circ$  to  $\pm 80^\circ$  with  
respect to the direction to be taken by a product flowing through the housing  
from the inlet to the outlet through the housing (6).  
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2. Mixer/heat exchanger according to Claim 1, wherein for each fin (2a) or (2b)  
belonging to a layer (7) or (8), there is an opposite fin (2a') or (2b') to this fin  
on the tube (1).
- 20 3. Mixer/heat exchanger according to Claim 1, wherein the fins belonging to  
the successive layers of fins (7) or (8) are arranged alternately over the length  
of the tube (1).
4. Mixer/heat exchanger according to Claim 1, wherein the fins of adjacent  
25 layers (7, 8) are rotationally offset from each other by an angle of from  $85^\circ$  to  
 $95^\circ$  around the tube axis.
5. Mixer/heat exchanger according to Claim 1, wherein a plurality of tubes (1,  
1') having fins (2a, 2b) are arranged next to one another, transversely with  
30 respect to the direction to be taken (as in claim 1).

6. Mixer/heat exchanger according to Claim 1, wherein the housing (6) has feedlines (4) and discharge lines (5) for a heat-transfer medium, which lines are respectively connected to the inlet and outlet of the tube passages (3, 3').
- 5 7. Mixer/heat exchanger according to Claim 1, wherein the tubes (1, 1') which are provided with fins (2a, 2b) are arranged one behind the other in a plurality of planes in the housing (6).
8. Mixer/heat exchanger according to Claim 1, wherein fins (2a, 2b) arranged  
10 on adjacent tubes (132, 132') overlap each other.
9. Mixer/heat exchanger according to Claim 1, wherein the fins (2a, 2b) of successive layers of fins (7, 8) are staggered with respect to one another along the tubes (1, 1', 1'').
- 15 10. Mixer/heat exchanger according to Claim 1, wherein the radial extent of the fins (2a, 2b) on a tube amounts to at least 0.5 times the internal diameter of the tube (1).
- 20 11. Mixer/heat exchanger according to Claim 1, wherein the inside wall of the tubes (1, 1', 1'') are contoured to increase their surface area.
12. Mixer/heat exchanger according to Claim 1, wherein some of the fins (2, 2a', 2b, 2b') of the tubes (1) are hollow, and the hollow space therein is in  
25 communication with the passage (3) in the tube (1).
13. Mixer/heat exchanger according to Claim 1, wherein the tubes (1, 1', 1'') are provided with a resistance heating element or an electrical cooling element.
- 30 14. Mixer/heat exchanger according to Claim 1, wherein the tubes (1, 1', 1'') or the fins (2a, 2b), or both the tubes and the fins are coated with a catalyst.

15. Mixer/heat exchanger according to Claim 1, wherein the tubes (1, 1', 1'') are arranged at an angle  $\gamma$  of at most  $\pm 15^\circ$  in the housing (6), as seen in the transverse direction with respect to the overall flow direction through the housing from the product inlet to the product outlet.
- 5 16. Mixer/heat exchanger according to Claim 1, wherein the tubes (1, 1a) which are provided with fins (2a, 2b) are arranged one behind the other in the overall flow direction through the housing, from the product inlet to the product outlet, in a plurality of planes in the housing (6), and the tubes (1) belonging to adjacent planes have differently dimensioned fins (2a, 2b) than each other.
- 10 17. Mixer/heat exchanger according to Claim 1, wherein the mixer/heat exchanger has at least one substance-introduction tube, which is arranged parallel to the other tubes (1), is provided with fins (2a, 2b) and has a plurality of openings (14) leading to the interior of the housing (6).
- 15 18. Mixer/heat exchanger according to Claim 1, wherein the tubes (1) have passages (3), in the outflow region of which a nozzle (3') of reduced diameter compared to the passages (3) is fitted.
- 20 19. A method for controlling the temperature of viscous substance systems having a viscosity of from 0.001 to 20,000 pa.s, which comprises passing said substance systems through the mixer/heat exchanger of Claim 1, and heating or cooling said substance systems by heat transfer through the tubes of said mixer/heat exchanger.
- 25 20. The mixer/heat exchanger of Claim 1, wherein said angle  $\alpha$  is  $70^\circ$  to  $110^\circ$ .
- 30 21. Mixer/heat exchanger of Claim 11, wherein said inside walls are contoured in the form of longitudinal ribs.